

Action Plan for the Forked Three-awned Grass (*Aristida basiramea*) in Quebec

Forked Three-awned Grass



2014



Government
of Canada

Gouvernement
du Canada

Canada

Recommended citation:

Environment Canada. 2014. Action Plan for the Forked Three-awned Grass (*Aristida basiramea*) in Quebec. *Species at Risk Act* Action Plan Series, Environment Canada, Ottawa, iv + 21p.

For copies of the action plan, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, recovery strategies, and other related recovery documents, please visit the Species at Risk Public Registry¹.

Cover illustration: © André Sabourin, Consulting Botanist

Également disponible en français sous le titre :

« Plan d'action pour l'aristide à rameaux basilaires (*Aristida basiramea*) au Québec »

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2014. All rights reserved.

ISBN 978-1-100-25272-8

Catalogue no. CW69-21/7-2015E-PDF

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

¹ <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

Preface

Federal, provincial and territorial government signatories under the Accord for the Protection of Species at Risk (1996)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, ch. 29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as Extirpated, Endangered, and Threatened for which recovery has been deemed feasible. They are also required to report on progress five years after the publication of the final document in the SAR Public Registry.

Under SARA, one or more action plan(s) provides the detailed recovery planning that support the strategic direction set out in the recovery strategy for the species. The plan outlines what needs to be done to achieve the population and distribution objectives (previously referred to as recovery goals and objectives) identified in the recovery strategy, including the measures to be taken to address the threats and monitor the recovery of the species, as well as the proposed measures to protect critical habitat that has been identified for the species. The action plan also includes an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. The action plan is considered one of a series of documents that are linked and should be taken into consideration together. Those being the COSEWIC Status Report, the recovery strategy, and one or more action plans.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers under SARA for the Forked Three-awned Grass and have prepared this action plan to implement the recovery strategy, as per section 47 of SARA. To the extent possible, it has been prepared in cooperation with the Government of Quebec (Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs) in accordance with subsection 48(1) of SARA.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the Forked Three-awned Grass and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

² <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

Acknowledgements

This action plan was developed by Vincent Carignan and Matthew Wild (Environment Canada, Canadian Wildlife Service – Quebec Region) with the collaboration of Patrice Laliberté (Nature Conservancy of Canada). The following individuals contributed to improving the text: Alain Branchaud, Geneviève Langlois and Karine Picard (Environment Canada, Canadian Wildlife Service – Quebec Region); Charles Latour and Marjorie Mercure³, and the Comité de mise en œuvre du rétablissement des plantes des milieux dunaires du sud du Québec, consisting of Carine Deland and Caroline Bélair⁴ (Nature Conservancy Canada – Quebec region), André Sabourin (consulting botanist), Patricia Désilets (Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs du Québec) and Jacques Brisson (Université de Montréal). Ken Tuininga, Marie-Claude Archambault, Angela Darwin, Krista Holmes, Rachel deCatanzaro and Madeline Austen (Environment Canada, Canadian Wildlife Service – Ontario Region) were consulted in order to align the Quebec and Ontario action plans as much as possible.

³ Formerly of Environment Canada, Canadian Wildlife Service – Quebec region.

⁴ Formerly with Nature Conservancy Canada – Quebec region

Executive Summary

This action plan complements the Recovery Strategy for the Forked Three-awned Grass (*Aristida basiramea*) in Canada, published in 2007. The proposed recovery measures seek to implement the broad strategies and approaches to recovery set out in the recovery strategy for populations and suitable habitat in Quebec. A separate action plan has been prepared for populations and suitable habitat in Ontario.

Given that the critical habitat of the species was not identified in the recovery strategy, this action plan identifies the critical habitat for the populations located in the province of Quebec. The critical habitat for the Forked Three-awned Grass corresponds to all suitable habitats within sand deposits and exposed sandstone outcroppings in the general areas where the species is known to occur. Currently, these are Cazaville and Ormstown in the extreme southwest of Quebec.

The critical habitat identified in this action plan is located entirely on non-federal land. Proposed measures to protect critical habitat are presented in section 1.3.

A schedule that establishes the implementation priorities for the recovery measures addresses the following general strategies for the species' recovery in Quebec : 1) stewardship and management of the species and its suitable habitat, 2) surveys and monitoring, 3) research, and 4) communication and awareness.

A socio-economic cost-benefit evaluation for implementing this action plan is presented. Moderate social and economic impacts and some potential land-use constraints are expected, especially with regard to quarry and sandpit operations. The direct implementation costs are estimated to be close to \$1,200,000 for the 2014–2019 period.

Table of Contents

Preface.....	i
Acknowledgements.....	ii
Executive Summary.....	iii
1. Recovery Actions.....	1
1.1 Context and Scope of the Action Plan.....	1
1.2 Critical Habitat.....	4
1.2.1 Identification of the species' critical habitat.....	4
1.2.2 Examples of activities likely to result in destruction of critical habitat.....	5
1.3 Proposed Measures to Protect Critical Habitat.....	7
Proposed protection measures for non-federal lands.....	7
1.4 Measures to be Taken and Implementation Schedule.....	8
2. Socio-economic Assessment.....	10
2.1 Impacts.....	11
2.1.1 Direct costs.....	11
2.1.2 Indirect costs.....	12
2.2 Benefits.....	12
2.3 Conclusion.....	12
3. Measuring Progress.....	13
4. References.....	14
APPENDIX A: Critical Habitat for the Forked Three-awned Grass in Quebec.....	17
APPENDIX B: Effects on the Environment and Other Species.....	20

1. Recovery Actions

1.1 Context and Scope of the Action Plan

The Forked Three-awned Grass (*Aristida basiramea*) is an annual grass, 30 to 60 cm high, that grows in tufts (COSEWIC 2002). It is found in sandy, acidic, dry and bare environments, as well as on exposed sandstone outcroppings (Sabourin 2010, 2012), but can also grow in roadside ditches and abandoned fields (COSEWIC 2002). The species has been listed as Endangered in Schedule 1 of the *Species at Risk Act* (SARA) since 2005. In Quebec, it has been designated as Threatened under the *Act respecting threatened or vulnerable species* since 2010, and data are incorporated in the Centre de données sur le patrimoine naturel du Québec (CDPNQ 2014).

At the time of publication of the *Recovery Strategy for the Forked Three-awned Grass* (*Aristida basiramea*) in Canada (Jones 2007), five populations of about 120 000 individuals were known: four in Ontario and one in Quebec (Figure 1). More recent surveys and publications (NCC 2008, 2014; Sabourin 2010, 2012; Environment Canada 2014) indicate that Canada is home to at least 19 populations (3 million individuals), including 11 populations south of Ontario's Georgian Bay and eight⁵ in southwestern Quebec (Table 1). This action plan applies only to Quebec populations; Ontario populations are addressed in a separate action plan.

⁵ CDPNQ (2014) considers that Cazaville is home to six different populations as opposed to a single population as mentioned in the recovery strategy. There are also two populations around Ormstown, one of which was found in the summer of 2012.

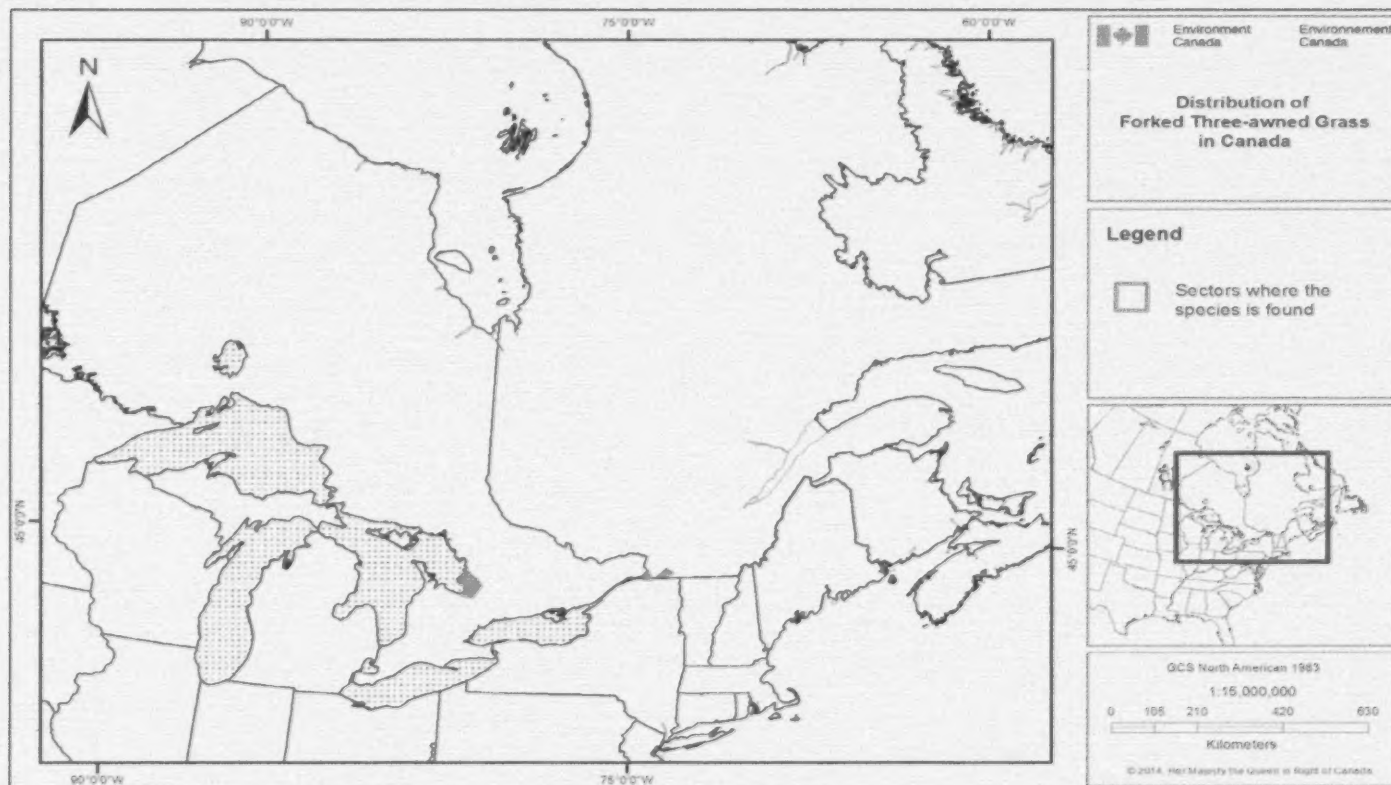


Figure 1. Known distribution of the Forked Three-awned Grass in Canada.

Table 1. Description of Forked Three-awned Grass populations in Quebec (CDPNQ 2014).

General Area ⁶	Population (CDPNQ no.)	Described in Recovery Strategy (Yes/No)	Number of Individuals	Type of Habitat
Cazaville	Saint-Anicet (St-Charles road) (15103)	Yes	Several thousands	Old quarries, sandy openings and an old field
	Saint-Anicet (Trépanier road) (15104)	Yes	Several hundreds	Along a trail adjacent to a red pine plantation
	Saint-Anicet (Smith and Neuf roads) (15105)	Yes	Over 10 000	Old sandpits, relatively clear sandy openings
	Saint-Anicet (Currie road) (15106)	Yes	Unspecified (5 to 37/m ²)	Old sandpit and sandy wildland, along the sides of trails and roads
	Godmanchester (Ridge road) (15107)	Yes	Unknown	Along the road
	Godmanchester (Carr road) (15108)	Yes	Unspecified (78/m ²)	Inactive quarry area and opening along an all-terrain vehicle trail
Ormstown	Très-Saint-Sacrement (Le Rocher) (20263)	No	Over 1 000	Sandstone outcrops near a road
	Franklin (20985)	No	Over 40 000	Sandstone outcrops near a road and along all-terrain vehicle trails

Threats to the Forked Three-awned Grass include sand and sandstone extraction, garbage dumping, all-terrain vehicle use (ATV), plant succession, conifer planting, invasive species, agricultural activities and subdivision development. The limited nature of its habitat and the absence of certain ecological processes (or natural disturbances) are limiting factors.

The objective of the action plan for the Forked Three-awned Grass is to implement the recovery strategy, whose goal is to maintain self-sustaining populations of *Aristida basiramea* in all the areas where the species exists in an indigenous state in Canada. The action plan should be considered complementary to the Conservation plan for the Forked Three-awned Grass published by the government of Quebec (Désilets et al.

⁶ In the recovery strategy, the term « locality » is used to describe the general areas within which Forked Three-awned Grass populations are found. Each general area (or locality) spans over multiple municipalities.

2012), in which six of the seven populations⁷ in the province are identified as being priority species conservation targets. The Nature Conservancy of Canada has also developed a conservation plan for the Cazaville dunes and the Forked Three-awned Grass, which will be updated in the coming years (NCC 2008).

The recovery strategy provides more details on the strategic direction and approaches for the recovery of the species, as well as on the species and the factors threatening it.

1.2 Critical Habitat

The critical habitat of the Forked Three-awned Grass is identified in this action plan and is considered sufficient to achieve the population and distribution objectives⁸ in Quebec.

1.2.1 Identification of the species' critical habitat

The critical habitat of the Forked Three-awned Grass is identified as all suitable habitat within sand deposits and exposed sandstone outcroppings in the general areas where the species is known to occur.

The biophysical attributes of the suitable habitat for the Forked Three-awned Grass include :

- 1) Dry environments with either :
 - a. Superficial sand deposits⁹ (e.g. dry herbaceous prairies, open dunes, clearings, sparse pine stands, uncultivated fields) that mark the Champlain Sea retreat in the postglacial era, or;
 - b. Superficial deposits on exposed sandstone outcroppings¹⁰ (e.g. dry, shortgrass prairie, bryophytes and lichen of the genus *Cladonia*; Désilets et al. 2012);
- 2) High availability of sunlight at ground level;
- 3) Limited competition from other dry environment plants, particularly invasive species (bare soil averages 33%; Barbeau and Brisson 2004);
- 4) Associated herbaceous plants including Poverty Oat-grass (*Danthonia spicata*), Canada Bluegrass (*Poa compressa*), Common Milkweed (*Asclepias syriaca*) and rare thermophilic species at the northern limit of their range, such as Horsemint (*Monarda unctata* var. *villicaulis*), Forked Bluecurls (*Trichostema dichotomum*), Poverty Dropseed (*Sporobolus vaginiflorus* var. *vaginiflorus*) and Rough False Pennyroyal (*Hedeoma hispida*)¹¹.

As an annual species living in a dynamic environment, Forked Three-awned Grass is subject to constant variations throughout its populations (Jones 2007). It is likely that it

⁷ The second population in Ormstown had not yet been found when the provincial conservation plan was published.

⁸ The previous recovery strategy format uses the term "recovery goal."

^{9, 10} PQ07 Beauharnois and Huntingdon survey and PQ16 Châteauguay survey from the soil database <http://www.irda.qc.ca/en/Soil-Survey-Reports> [French only]

¹¹ For a more detailed list of associated species, see Barbeau and Brisson (2004).

maintains its presence in a region not by occupying the same openings recurrently, but by colonizing openings newly created by a variety of disturbances (e.g. blowdowns, fires, droughts, tree harvesting, non-intensive ATV trails). Thus, all sand or sandstone substrates, even those where growth conditions are not currently optimal, could eventually be colonized. Consequently, the boundaries of the critical habitat were established taking into account the extent of the sand deposits in the Cazaville general area and the extent of the sandstone outcroppings in the Ormstown general area. A total of 28 322 ha are identified as critical habitat, including 12 006 ha in the Cazaville general area and 16 316 ha in the Ormstown general area. The critical habitat includes all known populations of Forked Three-awned Grass in Quebec and thus the six populations identified as conservation targets by the government of Quebec.

Appendix A (Table A-1; figures A-1 et A-2) present the 10 km x 10 km standardized UTM squares (red outlines) as well as the critical habitat units (yellow polygons) for the Forked Three-awned Grass. The standardized national grid system indicates the general geographic area within which critical habitat can be found and can serve for various uses including landuse planning and environmental assessment. Anthropogenic structures (e.g., roads, buildings) and areas (e.g., dense forests, wetlands) that do not possess the biophysical attributes of the suitable habitat are not identified as critical habitat.

1.2.2 Examples of activities likely to result in destruction of critical habitat

Critical habitat destruction is determined on a case-by-case basis. Destruction has occurred if part of the critical habitat was degraded, either permanently or temporarily, to the point where it can no longer meet the species' requirements. Destruction may be the result of one or more activities at a given time or the cumulative effects of one or more activities over a period of time (Government of Canada 2009). Table 2 presents examples of activities that can lead to the destruction of Forked Three-awned Grass critical habitat.

Table 2. Examples of activities likely to destroy the critical habitat of the Forked Three-awned Grass in Quebec.

Description of Activity	Description of Impacts (biophysical or other attributes)	Other Considerations
Construction and maintenance of linear structures (e.g. roads, highways, energy corridors, pipelines)	The substrate is covered permanently, drainage conditions are modified, soil disturbance leads to the growth of invasive species.	Applicable at all times if impact is long-term. Otherwise, avoid disturbing the habitat in a way that would compromise plant growth.
Construction of housing units or commercial or industrial buildings	The substrate is covered permanently, drainage and light conditions are modified, competition with alien/invasive plants increases (e.g. lawn, landscaping).	Applicable at all times.
Mining (e.g. soil preparation, mineral extraction, using heavy vehicles to transport materials)	Surface extraction: the substrate is removed from the site or modified through disintegration or compaction; drainage conditions are modified. Underground extraction: same effects, but no substrate removal.	Applicable at all times if impact is permanent (e.g. extraction to the bedrock). Otherwise, avoid modifying drainage conditions (flooding) during the plant growth period.
Repeated traffic from off-road vehicles (e.g. ATVs) for many consecutive years	The substrate is modified due to disintegration or compaction (repeated traffic over many consecutive years); drainage conditions are modified; soil disturbance leads to the growth of invasive species.	Applicable at all times.
High-density conifer planting	Light conditions at ground level are modified; chemical and mechanical control of subforest vegetation prevents seed production.	Applicable at all times if impact is long-term.
Dumping of garbage (e.g. fill soil, construction debris, household garbage, plant debris)	The substrate is covered permanently; drainage or light conditions are modified.	Applicable at all times if impact is long-term.

1.3 Proposed Measures to Protect Critical Habitat

The critical habitat of the Forked Three-awned Grass is located only on non-federal land in Quebec.

Proposed protection measures for non-federal lands

With regard to the portions of critical habitat on non-federal lands, Environment Canada intends to work with the Government of Quebec to determine whether provincial legislation and regulations provide for critical habitat protection for this species under SARA.

In accordance with its jurisdiction, Environment Canada's approach is to start by looking at provincial legislation and, where necessary, to assess whether provisions or measures under SARA or any other federal legislation can protect these portions of critical habitat.

If it is determined that the critical habitat is not protected or is only partially protected, the progress made toward achieving its protection will be communicated in the Species at Risk Public Registry through the reports referred to in section 63 of SARA.

The implementation of conservation measures is an important complementary strategy for preserving this species' critical habitat. Environment Canada will work with the Government of Quebec, non-governmental organizations and individuals to facilitate the implementation of conservation measures.

1.4 Measures to be Taken and Implementation Schedule

Table 3. Implementation Schedule.

#	Recovery Measures	Priority ¹²	Threats or Concerns Addressed	Schedule
Broad Strategy: Stewardship and management of the species and its suitable habitat (includes general approaches 1, 5, 6, 7, 9, 11, 13, 21 and 23 of the recovery strategy ¹³)				
Approach: Implement measures that aim to ensure the maintenance of self-sustaining populations				
1	Collaborate with regional county municipalities, municipalities and landowners of targeted lots in order to identify conservation measures (e.g. stewardship, zoning, beneficial agro-forestry management practices) and integrate these measures into land-use planning.	High	All threats	2014–2019
2	Prepare and implement a research program on habitat management techniques in order to reduce or eliminate practices that are incompatible with the recovery of dune environment species in each of the occupied sites and in adjacent areas (e.g. update the Cazaville dunes conservation plan, NCC 2008; also see Laliberté 2008).	High	All threats; absence of some ecological processes	2014–2019
3	Plan stewardship measures for suitable habitat that is not currently colonized.	Medium	All threats	2014–2019
4	Periodically assess the threats and the intervention priority for each population.	Medium	All threats	2019
5	Collaborate with quarry managers in order to set up an operation plan that ensures the maintenance of species numbers on lots that are being used—or that will or may be used—for sand extraction and dumping of garbage.	Medium	Sand and sandstone extraction; dumping of garbage	2014–2019
6	Collaborate with landowners who use ATVs or who allow ATV owners to drive on their property in order to limit circulation to marked trails. If necessary, the trails could be relocated after a few years of use in order to make the exposed substrate available for colonization by the Forked Three-awned Grass.	Medium	Limited habitat; absence of certain ecological processes; plant succession; ATV use	2014–2019

¹² "Priority" reflects the way in which the action directly contributes to or is an essential precursor to an action that contributes to the recovery of the species.

¹³ Note that the priority associated with each measure may differ from that indicated in the recovery strategy given that this action plan applies to Quebec populations only.

#	Recovery Measures	Priority ¹²	Threats or Concerns Addressed	Schedule
7	Oversee tree planting to align it with the maintenance of Forked Three-awned Grass.	Medium	Planting of conifers	2014–2019
Broad Strategy: Surveys and monitoring (includes general approaches 2, 17 and 22 of the recovery strategy)				
Approach: Develop and implement a standardized survey and monitoring protocol to evaluate the status of populations and habitat				
8	Every five years, visit sites where the Forked Three-awned Grass occurs to evaluate the population trend and determine whether the situation has changed in terms of disturbances, plant cover, and the presence of invasive species and other threats. Incorporate the data in the CDPNQ.	High	All threats	2014, 2019
9	Monitor sites that have undergone recovery actions in order to assess their success and any required maintenance (see measure 2).	Medium	Limited habitat; absence of certain ecological processes; plant succession	2016–2018
10	Survey potential sites, starting with the areas closest to those currently occupied by the species.	Low	Knowledge gaps	2014–2019
Broad Strategy: Research (includes general approach 21 in the recovery strategy)				
Approach: Study aspects related to the propagation of individuals				
11	Determine the viability of the seed bank and the dispersion capabilities (population connectivity).	Medium	Knowledge gaps	2014–2019
12	Study the historical significance of natural disturbances in the maintenance of the species' habitat.	Low	Knowledge gaps	2014–2019
Broad Strategy: Communication and awareness (includes general approaches 9, 10 and 14 of the recovery strategy)				
Approach: Develop and implement a communications strategy together with partner agencies and groups interested in the species				
13	Encourage discussions among stakeholders (scientists, recovery teams and implementation groups, non-governmental organizations, levels of government, the general public, private landowners) through yearly meetings, presentations to partners, public information evenings, landowner notebooks, etc.	High	All threats	2014–2019

#	Recovery Measures	Priority ¹²	Threats or Concerns Addressed	Schedule
14	Encourage support from the general public and land-management decision-makers (municipalities, regional county municipalities [RCMs], regional conferences of elected officials) for species conservation through brochures, articles for the general public, websites, an information sign, etc.	Medium	All threats	2014–2019

2. Socio-economic Assessment

The *Species at Risk Act* requires that an action plan include an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation (SARA 49(1)(e), 2003). This evaluation addresses only the incremental socio-economic costs of implementing this action plan from a national perspective as well as the social and environmental benefits that would occur if the action plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the action plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. The Act recognizes that “wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons” (SARA 2003). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White, 1996; DFO., 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the Accord for the Protection of Species at Risk. The specific costs and benefits associated with this action plan are described below.

2.1. Impacts

2.1.1. Direct costs

Table 4 breaks down the anticipated direct costs of implementing all the recovery measures proposed in Table 3 based on the four broad strategies¹⁴. These costs are estimated for the period from 2014 to 2019¹⁵ and include property acquisitions and expenditures related to field work (salaries, travel, equipment, actions, etc.).

Table 4. Estimated direct costs of implementing the Forked Three-awned Grass recovery measures, 2014–2019.

Broad Strategy	Priority	Governments (federal and provincial)	Other Stakeholders
Stewardship and management of the species and its suitable habitat	High	\$910,000 (75%)	\$215,000 (25%)
Surveys and monitoring	Average	\$25,000 (67%)	\$12,000 (33%)
Research	Average	\$1,000 (25%)	\$2,000 (75%)
Communication and awareness	Average	\$25,000 (60%)	\$10,000 (40%)
		\$961,000 (75%)	\$239,000 (25%)
		\$1,200,000	

Modifying certain sand extraction activities in quarries could be beneficial in meeting the needs of the Forked Three-awned Grass. If modifications were implemented through an operation plan, they could result in a decrease in the volume of substrate that can be extracted yearly. Specifically, quarry operators could have to avoid digging all the way down to the bedrock and leave intact a portion of their operational area so that the sandy, dry ecosystem remains. Individuals of the species that are in this area could then possibly recolonize the mined areas and the area that initially remained intact could potentially be mined.

¹⁴ The costs are a compilation of the estimated costs for each of the activities in Table 3. They were determined by consulting the main stakeholders involved in species conservation. Given that the stakeholders often focus their work on several species or, more generally, on habitat, the costs presented may not be entirely attributable to the Forked Three-awned Grass.

¹⁵ According to the terms of section 55 of SARA, progress in achieving the objectives described in the action plan must be evaluated and a report must be produced regarding the plan's implementation and its ecological and socio-economic impacts five years after the plan takes effect.

Using a habitat for agricultural or forestry purposes could have several impacts on Forked Three-awned Grass habitat. If modifications to practices were necessary, they could result in reducing the quality of harvested forage crops due to harvesting restrictions during the growth and reproduction period of the Forked Three-awned Grass. The density or height of trees in some planting areas could also have to be lowered to avoid creating too much shade, which could result in decreasing the amount of wood substance produced on a site.

The decrease in revenues caused by use restrictions is not included in Table 4 because of the difficulty of this type of analysis. It is, however, taken into account in the conclusion of this action plan.

2.1.2. Indirect costs

Indirect impacts involve the potential restrictions, in terms of the non-economic uses of the species or the territory it occupies, associated with the implementation of recovery measures. Notably, the use of all-terrain vehicles should be the subject of stewardship activities. Rather than prohibiting ATV traffic on properties where the species is present, this action plan proposes to concentrate use to a few well-marked trails whose routes could be modified, if necessary, after a few years of use. This measure would contribute to regenerating suitable habitat while allowing landowners to enjoy their property.

2.2. Benefits

Implementation of the recovery measures proposed in this action plan will have favourable repercussions for the Forked Three-awned Grass and other rare species associated with dry environments (see Appendix B). In recent years, surveys have made it possible to identify a dozen species infrequently seen in Quebec that are adapted to these types of habitat (Sabourin 2010). In addition, awareness by landowners and the public of the ecological importance of sandy environments and exposed rock outcroppings that, at first glance, appear to be of little interest will lead to their reclamation. Their protection through stewardship measures, property acquisition and restoration projects will also improve their ecological integrity.

2.3. Conclusion

The socio-economic analysis suggests that implementing all the recovery measures proposed in this action plan will result in moderate socio-economic costs; some potential constraints related to land use are also anticipated, particularly regarding quarry and sandpit operations. The direct costs of implementation are estimated to be close to \$1,200,000 for the 2014–2019 period.

3. Measuring Progress

The performance indicators presented in the associated recovery strategy provide a way to define and measure progress toward achieving the population and distribution objectives.

Reporting on *implementation* of the action plan (under s. 55 of SARA) will be done by assessing progress towards implementing the general strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under s. 55 of SARA) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

4. References

- Almack K. and S. Wilson. 2010. Economic value of Toronto's Greenbelt, Canada. The Economics of Ecosystems and Biodiversity. <http://www.teebweb.org/>.
- Balmford A., A. Bruner, P. Cooper, R. Costanza, S. Farber, R. E. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper and R. K. Turner. 2002. Economic reasons for conserving wild nature. *Science* 297: 950–953.
- Barbeau, O. and J. Brisson. 2004. La situation de l'aristide à rameaux basilaires (*Aristida basiramea* Engelm. ex. Vasey) au Québec. [the status of Forked Three-awned Grass in Quebec]. Institut de recherche en biologie végétale. Report prepared for the Ministère de l'Environnement du Québec, Direction du patrimoine écologique et du développement durable. 30 pp.
- Barbier, E. B. and G. M. Heal. 2006. Valuing Ecosystem Services. The Economists' Voice. Vol. 3(3), Article 2. DOI: 10.2202/1553-3832.1118 <http://www.bepress.com/ev/vol3/iss3/art2>.
- Canada Gazette. 2007. DORS/2007-275 to 307 and TR/2007-114 to 117, Vol. 141, No. 26, p. 2520 to 2919.
- CDPNQ. 2008. Centre de données sur le patrimoine naturel du Québec. Les plantes vasculaires menacées ou vulnérables du Québec, 3rd edition. [threatened or vulnerable vascular plants in Quebec]. Government of Quebec, Ministère du Développement durable, de l'Environnement et des Parcs, Direction du patrimoine écologique et des parcs, Québec. 180 pages.
- CDPNQ. 2014. *Aristida basiramea* Aristide à rameaux basilaires. Centre de données sur le patrimoine naturel du Québec. 5 p.
- COSEWIC. 2002. COSEWIC Assessment and Status Report on the Forked Three-awned Grass (*Aristida basiramea*) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 31 p.
- Désilets, P., Couillard, L., and J. Letendre. 2012. Plan de conservation de l'aristide à rameaux basilaires (*Aristida basiramea*) : Espèce menacée au Québec. [conservation plan for the Forked Three-awned Grass (*Aristida basiramea*): threatened species in Quebec]. Government of Quebec, Ministère du Développement durable, de l'Environnement et des Parcs, Direction du patrimoine écologique et des parcs, Québec. 16 pp.
- Environment Canada. 2010. Planning for a Sustainable Future: A Federal Sustainable Development Strategy for Canada, 89 p. <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=16AF9508-1> [Online].

- Environment Canada. 2014. Action Plan for the Forked Three-awned Grass (*Aristida basiramea*) in Ontario [proposed]. *Species at Risk Act* Action Plan Series. Environment Canada, Ottawa. 21pp.
- Fisheries and Oceans Canada. 2008. Estimation of the Economic Benefits of Marine Mammal Recovery in the St. Lawrence Estuary. Regional Policy and Economics Branch, Québec, 2008.
- Government of Canada. 2009. *Species at Risk Act* Policies, Overarching Policy Framework [Draft]. *Species at Risk Act*, Policies and Guidelines Series, Environment Canada, Ottawa. 38 p.
- Isbell, F., V. Calcagno, A. Hector, J. Connolly, W.S. Harpole, P.B. Reich, M. Scherer-Lorenzen, B. Schmid, D. Tilman, J. van Ruijven, A. Weigelt, B.J. Wilsey, E.S. Zavaleta and M. Loreau. 2011. High plant diversity is needed to maintain ecosystem services, *Nature* 477: 199–202.
- Jones, J. A., 2007. Recovery Strategy for the Forked Three-awned Grass (*Aristida basiramea* Engelm. ex Vasey) in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada, Ottawa. 29 pp.
- Laliberté, P. 2008. Protocole d'intervention dans l'habitat des dunes de Cazaville. [intervention protocol for the habitat of the Cazaville dunes]. Nature Conservancy of Canada. 13 pp.
- Leigh, L., E. DuWors, M. Villeneuve, A. Bath, P. Bouchard, P. Boxall, D. Legg, S. Meis, R. Reid and T. Williamson. 2000. Importance of Nature to Canadians: The Economic Significance of Nature-related Activities. Environment Canada, Ottawa, 49 pp.
- Loomis, J.B. and D.S. White. 1996. Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis. *Ecological Economics* 18: 197–206.
- MDDEFP. 2013. Liste des plantes vasculaires susceptibles d'être désignées menacées ou vulnérables (314 espèces). Gouvernement du Québec, ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, Québec. 8p.
- Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: wetlands and water synthesis. World Resources Institute, Washington DC. 68 p.
- NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life (web application). Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed September 13, 2010).

- NCC. 2008. Plan de conservation des dunes de Cazaville et de l'aristide à rameaux basilaires. [Cazaville dunes and Forked Three-awned Grass conservation plan]. Nature Conservancy of Canada, Montreal. 40 pp. + appendices.
- NCC. 2014. Rapport d'inventaires floristiques et suivi de l'aristide à rameaux basilaires de 2011 à 2013. Conservation de la Nature Canada – région du Québec. 29 pp.
- Richardson, L. and J. Loomis. 2009. The total economic value of threatened, endangered and rare species: An updated meta-analysis. *Ecological Economics* 68(5): 1535–1548.
- Sabourin, A. 2010. Inventaires des plantes menacées ou vulnérables ou susceptibles d'être ainsi désignées et des principaux groupements végétaux dans le secteur dit Le Rocher et sur deux propriétés de Cazaville, dans la MRC Le-Haut-Saint-Laurent. Report prepared for the Nature Conservancy of Canada – Quebec Region. 13 pp.
- Sabourin, A. 2012. Inventaires floristiques pour documenter la présence de l'aristide à rameaux basilaires dans le secteur Le Rocher, et aménager deux sites pour favoriser le maintien de plantes à Cazaville. Rapport préparé pour Conservation de la nature – région du Québec. 24 pp.

APPENDIX A: Critical Habitat for the Forked Three-awned Grass in Quebec

Table A-1. Description of the 10 km x 10 km standardized UTM Squares within which Forked Three-awned Grass Critical Habitat can be Found in Quebec.

General Area	10×10-km UTM Grid Square ID ¹⁶	UTM Grid Square Coordinates ¹⁷		Estimated Area of Critical Habitat within the UTM Square (ha) ¹⁸	Land Tenure ¹⁹
		Easting	Northing		
Cazaville	18WQ48	540000	4980000	4 352	Non federal
	18WQ49	540000	4990000	2 582	Non federal
	18WQ58	550000	4980000	3 870	Non federal
	18WQ59	550000	4990000	1 202	Non federal
Ormstown	18WQ78	570000	4980000	75	Non federal
	18WQ79	570000	4990000	211	Non federal
	18WQ89	580000	4990000	2 430	Non federal
	18WQ99	590000	4990000	5 190	Non federal
	18WR90	590000	5000000	3 871	Non federal
	18XQ09	600000	4990000	2 703	Non federal
	18XR00	600000	5000000	1 837	Non federal
Total : 28 322 ha					

¹⁶ Based on the standard UTM Military Grid Reference System (see <http://www.nrcan.gc.ca/earth-sciences/geography-boundary/mapping/topographic-mapping/10098>), where the first 2 digits represent the UTM Zone, the following 2 letters indicate the 100 x 100 km standardized UTM grid, [as required for 10 and 1 km grid presentations of CH] followed by 2 digits to represent the 10 x 10 km standardized UTM grid. The last 2 digits represent the 1 x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org/> for more information on breeding bird atlases).

¹⁷ The listed coordinates represent the southwest corner of the 10 km × 10 km standardized UTM grid containing all or a portion of the critical habitat unit. The coordinates may not fall within critical habitat and are provided as a general location only.

¹⁸ The area presented is that of the unit(s) containing critical habitat (rounded up to the nearest 1 ha); therefore, the actual area of critical habitat may be significantly less. Refer to Section 1.2.1 for a description of how critical habitat within these areas is defined.

¹⁹ Land tenure is provided as an approximation of the types of land ownership that exist within the critical habitat units and should be used for guidance purposes only. Accurate land tenure will require cross-referencing critical habitat boundaries with surveyed land parcel information.

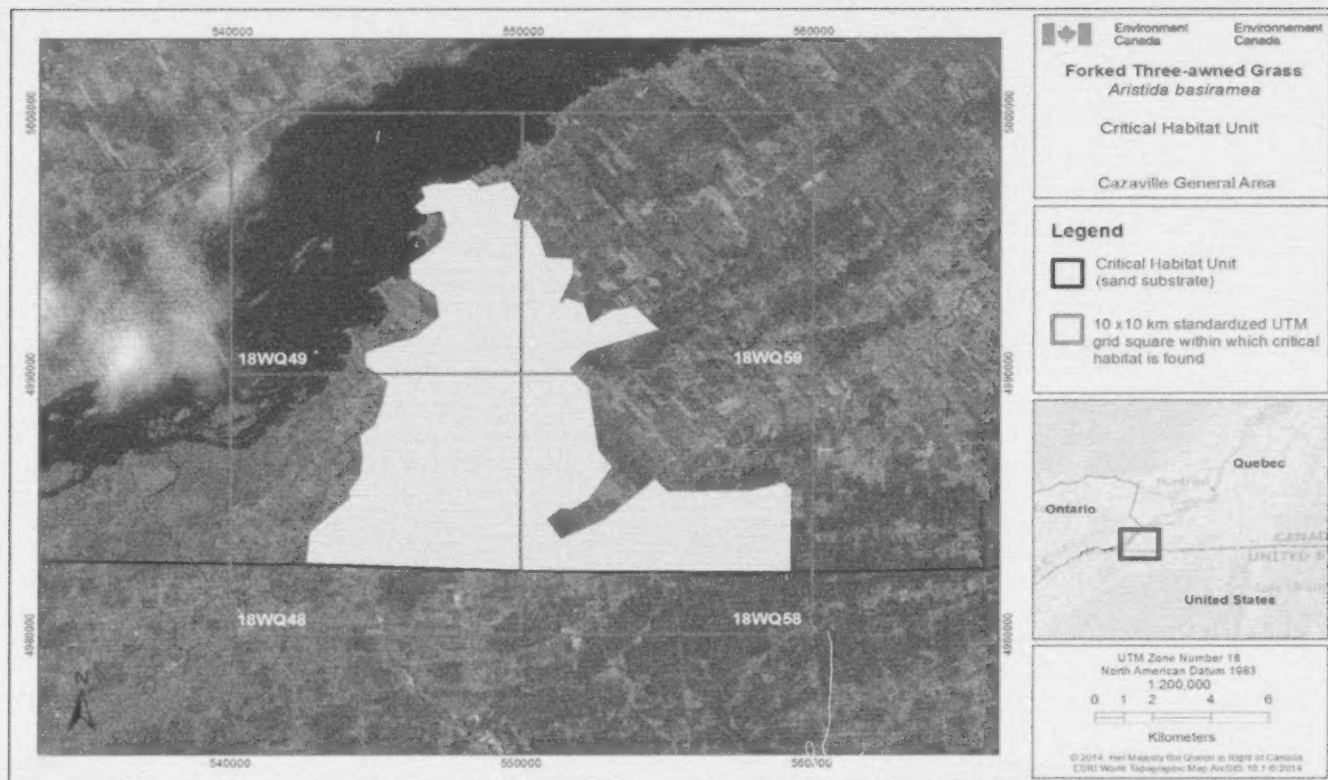


Figure A-1. Critical habitat for Forked Three-awned Grass in the Cazaville general area. Critical habitat occurs within the 10 km × 10 km standardized UTM squares (red outlines). The critical habitat unit (yellow) shows the approximate extent of areas that meet the criteria set out in Section 1.2.

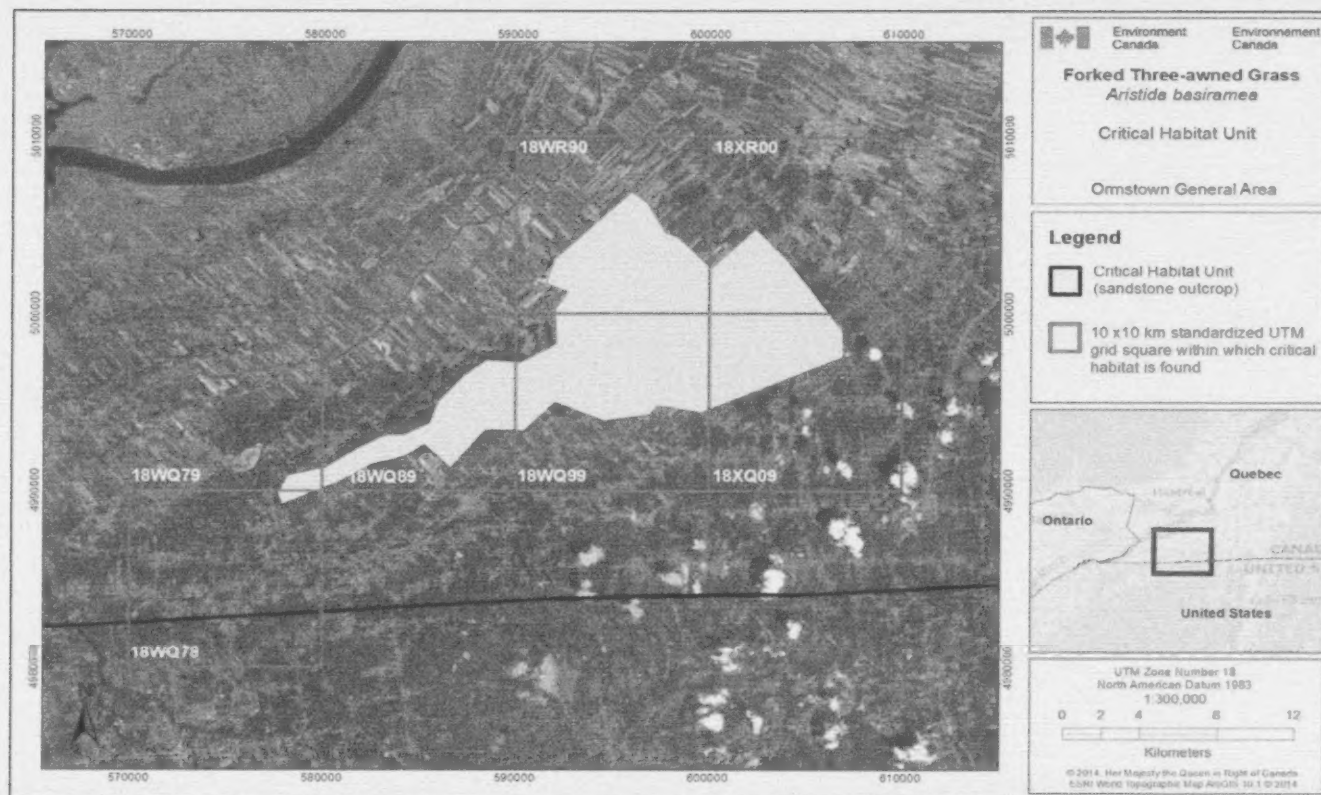


Figure A-2. Critical habitat for Forked Three-awned Grass in the Ormstown general area. Critical habitat occurs within the 10 km × 10 km standardized UTM squares (red outlines). The critical habitat unit (yellow) shows the approximate extent of areas that meet the criteria set out in Section 1.2.

APPENDIX B: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the Federal Sustainable Development Strategy's²⁰ (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

The possibility that the action plan might inadvertently produce negative effects on other species was considered. The SEA made it possible to conclude that this action plan will clearly be favourable to the environment and will not lead to any significant negative effects.

Other species at risk may benefit from the protection granted to the habitat of the Forked Three-awned Grass. Indeed, one of the only two occurrences in Quebec of Horsemint (designated as Threatened in Quebec since 2010 and a COSEWIC candidate species) is found in the same habitat as the Forked Three-awned Grass in Cazaville. Recently, Forked Bluecurls (not currently designated) was discovered in Cazaville's sandy habitat; surveys are needed to specify its distribution (André Sabourin and Caroline Bélair, personal communication). Also found there is the Rough False Pennyroyal, a species that is likely to be designated as threatened or vulnerable in Quebec (CDPNQ 2008; MDDEFP 2013). Rare species of plants of the *Cyperaceae* family were also observed in the habitat of the Forked Three-awned Grass: Great Plains Flat Sedge (*C. lupulinus* subsp. *macilentus*), and Schweinitz's Sedge (*C. schweinitzii*) (likely to be designated threatened or vulnerable in Quebec), of which one of only two known occurrences in Quebec can be found in the dunes of Cazaville (NCC 2008). Other species of great interest are also found in the habitat on the exposed sandstone outcrops of Ormstown (Le Rocher area), including Pitch Pine (*Pinus rigida*), a tree designated as Threatened in Quebec, and Poverty Dropseed (*Sporobolus vaginiflorus* var. *vaginiflorus*), very rare in Quebec (S1) and in Canada (N2?) (CDPNQ 2008; MDDEFP 2013).

²⁰ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

The potential vegetation control measures to combat plant succession in the absence of natural disturbances—measures that could result from this action plan—will presumably have positive effects on the rare pioneer species that belong to the same plant community as the Forked Three-awned Grass. The Horsemint is already reacting favourably to vegetation clearance in Cazaville (NCC 2008). To mitigate the impact of suggested interventions, efforts will be made to locate the rare species and prevent trampling. Manual labour using chain saws and brush cutters creates small openings and is less damaging for habitat than heavy machinery. Moreover, vegetation control activities will be carried out on limited, selective sections of the critical habitat in a targeted manner so as to maximize biodiversity in a variety of habitats at different stages of succession. Test plots will be monitored to ensure that the rare species that are present are not adversely affected by the work.